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ABSTRACT

In educating America's children for a technological world, schools must have the infrastructure in place before technology can be fully integrated into the curriculum. Findings of a national survey of school facilities concerning whether America's schools have appropriate technologies, such as computers, and the facility infrastructure to support these technologies are reported. Ten thousand schools were surveyed, augmented with visits to 10 selected school districts. Remarks address: (1) the need for technology in the nation's schools, and (2) problems schools report having in meeting those needs. It was found that, overall, the nation's schools were not even close to meeting their basic technology needs. Most schools do not fully use modern technology, and not all students have equal access to facilities that can support education into the 21st century, even those attending school in the same district. Appendix I discusses the four basic electronic systems comprising school communications technology: technology infrastructure, data systems, voice systems, and video systems. Appendix II offers relevant survey items with overall percent response. Appendix III provides data on technology elements. (MAS)

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United States General Accounting Office

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Testimony

Before the Subcommittee on Labor, Health and Human Services, Education and Related Agencies
Committee on Appropriations
United States Senate

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TECHNOLOGY

America's Schools Not Designed or Equipped for 21st Century

Statement of Linda G. Morra, Director
Education and Employment Issues
Health, Education, and Human Services Division

IR019177

GAO/T-HEHS-95-127

Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to assist you as you examine the federal role in programs that support technology integration into the public school curriculum.

In educating America's children for a technological world, schools must have the infrastructure in place before technology can be fully integrated into the curriculum. Schools, school districts, and states--as well as the federal government--are struggling with the large investment required for this to materialize. Fiscal constraints and the rapidly changing nature of technology make this a particularly difficult issue.

You asked us to focus today on the findings of our recently completed national survey of school facilities[1] concerning whether America's schools have appropriate technologies, such as computers, and the facility infrastructure to support these technologies. We have just issued another report on our survey that addresses how well America's schools are designed and equipped for the 21st century.[2] More specifically, our remarks will address (1) the need for technology in our nation's schools and (2) problems that schools report having in meeting those needs. Our perspective resulted from our survey of a nationally representative stratified random sample of about 10,000 schools, which we augmented with visits to 10 selected school districts.

In summary, we found that, overall, the nation's schools were not even close to meeting their basic technology needs. Most schools do not fully use modern technology, and not all students have equal access to facilities that can support education into the 21st century, even those attending school in the same district.

TECHNOLOGY NEEDS FOR AMERICA'S SCHOOLS

What would a school ready for the 21st century look like? After discussions with experts and reviews of the literature, we determined that rather than uniform-sized classrooms with rows of desks, a chalkboard, and minimal resources such as textbooks and encyclopedias, schools prepared to support 21st century education would probably have

-- flexible space, including space for small- and large-group instruction;

-- space to store and display alternative student assessment materials;

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[1]See School Facilities: Condition of America's Schools (GAO/HEHS-95-61, Feb. 1, 1995).

[2]School Facilities: America's Schools Not Designed or Equipped for the 21st Century (GAO/HEHS-95-95, Apr. 4, 1995).

-- facilities for teaching laboratory science, including demonstration and student laboratory stations, safety equipment, and appropriate storage space for chemicals and other supplies; and

-- a media center/library with multiple, networked computers to access information to outside libraries and information sources.

In addition, schools would probably have enough high-quality computers, some with CD-ROMs (compact disk read-only memory), printers, and computer networks for instructional use; modems; telephone lines for modems and telephones in instructional areas; television (TV) sets; laser disk players/video cassette recorders (VCR); cable TV; fiber optic cable; conduits/raceways for computer and computer network cables; electric wiring; and power for computers and other communications technology.[3] Networking capability in the classroom allows for use of a wide range of teaching and learning strategies that are not possible with stand-alone computers. For example, networks allow

-- groups of students simultaneous access to large data sources;

-- students to communicate with each other, with teachers, and with teachers and students in other schools; and

-- teachers to interact with students by computer as students work--engaging in online dialogs, referring to additional resources--or students to engage in group projects.

Although technology is changing constantly and quickly becoming defined by complex interactive and multimedia[4] technologies and standards are only beginning to emerge,[5] it helps to regard school communications technology as comprising four basic electronic systems: technology infrastructure, data, voice, and video. These systems transmit data--by computer networks, voice--by phone lines, and video--by TV, within the school, among different school

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[3]Experts have identified other key components affecting the implementation of technology in schools, such as sufficient teacher training and computer support services. However, because our focus was on school facilities, these components were not included in our survey.

[4]Multimedia uses a single communication system (cable) to transmit voice, data, and video, currently by digitizing voice and video.

[5]See, for example, The National Information Infrastructure: Requirements for Education and Training, National Coordinating Committee on Technology in Education and Training, (Alexandria, Va.: 1994).

buildings, to the outside world, and even to outer space. For a more detailed explanation of these systems, see appendix I.

State-of-the Art-Schools Are Few

Today, new schools are being designed with these changes in mind. Yet the nation only has a handful of such schools--mainly science high schools like Stuyvesant High School in New York City, or Thomas Jefferson High School in Virginia--that model state-of-the-art communications technologies. However, to prepare the nation's children and teenagers to be competitive as workers in the 21st century, experts and business leaders say modern communications technologies need to be part of America's elementary and secondary education, not just the sole province of a few special schools.

An example of state-of-the-art technology is found in Stuyvesant, the new science high school. Serving about 3,000 students, it has over 400 computers, most of which are arranged in 15 networks, with access to the Internet, as well as four antennae on the roof to communicate with satellites and virtually anyone else in the outside world. This school has the ability to directly access the latest information from the most sophisticated scientific satellites and participate in interactive "classes" with scientists in the field in the Amazon rain forest via interactive, multimedia networks like the JASON Project. This allows the students to talk with these scientists and observe them and the rain forest on their TV screens during regular class time, allowing them to go worldwide on "virtual" field trips.

MOST SCHOOLS DO NOT FULLY USE MODERN TECHNOLOGY

Although at least three-quarters of schools reported having sufficient computers and televisions, they do not have the system or building infrastructure to fully use them. Moreover, because computers and other equipment are often not networked or connected to any other computers in the school or the outside world, they cannot access the information super highway. Specifically, most schools have computers and TVs but little infrastructure to fully use technologies. Some of our respondents made very pointed comments about this:

> "We live in a state where we put more technology and safety in an automobile than we do in our schools."
>
> "We are not ready to join the information network proposed by Vice President Gore."

In response to our survey questions, over two-thirds of the schools reported having sufficient computers, printers, TVs, laser disk players/VCRs,[6] and cable TV.[7] However, school officials report that about 10.3 million students in about 25 percent of the schools do not have sufficient computers. Although most schools report having sufficient numbers of computers and other basic technology elements, they do not have the technology infrastructure to fully use them. (See fig. 1 and table 1.)

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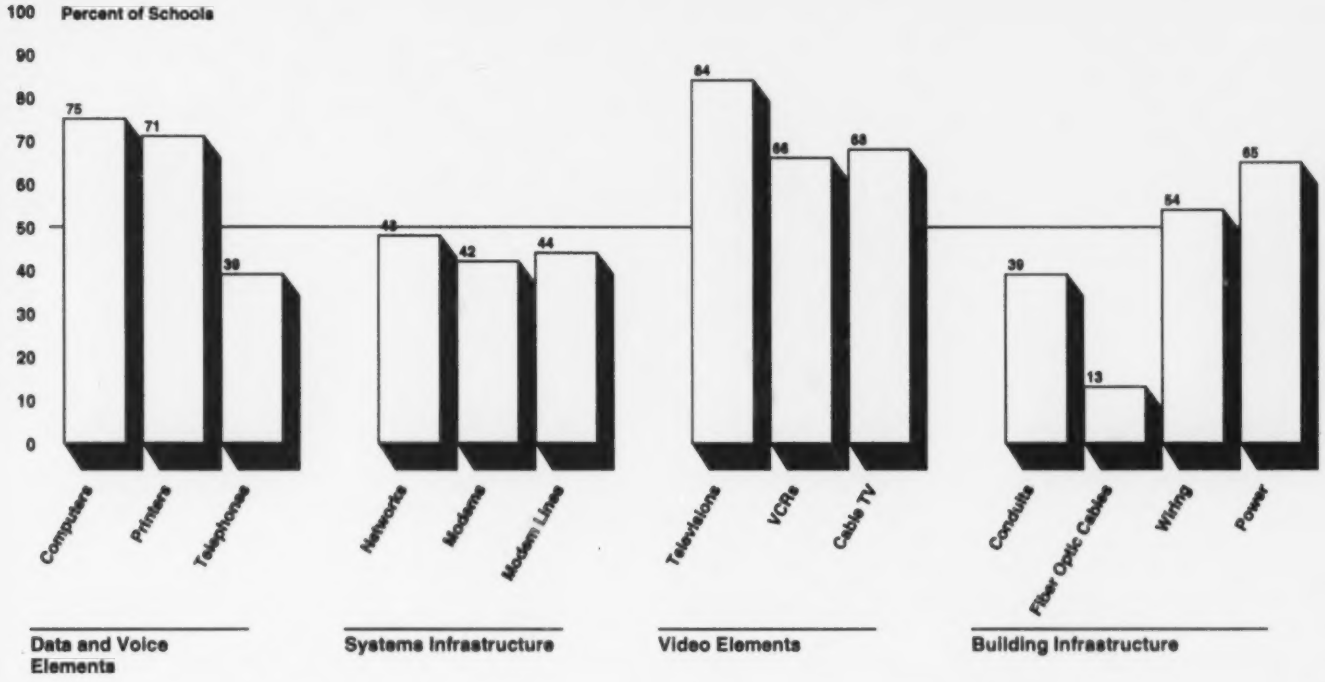
[6]Laser disk players and VCRs were rated as one item. It could be that there are a sufficient numbers of VCRs but not laser disk players.

[7]The self-reports of sufficiency may be overly optimistic for several reasons. First, in our analyses we included as "sufficient" responses that indicated moderately and somewhat sufficient capability, as well as very sufficient capability. This could indicate a wide range of sufficiency, including some responses that are very close to "not sufficient." Second, our analysis of responses showed that without any objective standards with which to anchor their responses, schools indicating "sufficient" computers had computer/student ratios that ranged from 1:1 to 1:292 (a median of 1:11) for those schools that had computers. About 300 schools that indicated they had no computers said that was sufficient. (See table III.9.) Finally, technology experts who regularly consult with school systems report that the level of knowledge among school administrators and staff of possible use and application of technology in schools is low--further increasing the likelihood that these sufficiency estimates are overly optimistic.

Figure 1: Most Schools Report Sufficient Computers and Televisions but Lack of Infrastructure to Fully Use Technology



Even in those schools reporting a sufficient number of computers, over one-third reported insufficient electrical wiring for computers/communication technology. Computers and other equipment that are not networked or connected to anything else in the school or in the outside world may be sufficient for basic or reinforcement activities, but they are limited in their access to the vast amount of electronic information available and do not allow for new information to enter the system or for the interaction between students, students and teachers, or the school and the outside world.

Over half of America's schools report insufficient capability in modems, phone lines for modems, phone lines for instruction, conduits/raceways, and fiber optics:

-- In central cities, over 60 percent of schools report insufficient networks, modems, phone lines (for modems or instruction), conduits and fiber optic cables. Over half report insufficient capability for electrical wiring for computer technology.

-- Schools with inadequate buildings[8] also were more likely to report insufficient capability to support technology. In every area of communications technology we asked about, schools with no inadequate buildings reported greater sufficiency than schools with one or more inadequate buildings. However, even in schools reporting no inadequate buildings, about one-half or more reported insufficient capability in areas related to interconnectivity, such as networks, modems and fiber optics.

Far from the high-tech world of interactive media and virtual reality, many of our schools are wired for no more than film projectors. One school district told us they use a computer bus--a high-tech version of the 1950s bookmobile--to meet the technology requirements of their six elementary schools. Many other issues are also important to the use of technology in our schools--such as teacher training and computer support services--but we did not ask about these in our survey. As one respondent commented,

"We need technology in the schools and teachers who can use the equipment. The percentage of teachers who can use computers is abysmally low, yet computers only scratch the surface of technology that should be available to all students, not just those who live in affluent areas. Interactive TV and telecommunications is a must in all schools, yet the cost of this technology remains prohibitively high for most small schools. For those schools who can afford it, the cost of training teachers to use it drives the costs up further."

Not All Students Have Equal Access to Technology

Our information shows that not all students have equal access to facilities that can support education into the 21st century (see table 1), even those attending school in the same district. Earlier we spoke about the state-of-the-art Stuyvestant High School. Only a few blocks away, we saw an example of one of the worst high schools in New York City. Overall, schools in central cities and those with a 50-percent or more minority population were more likely to have more insufficient technology elements than other schools. Several of our survey respondents made very pointed comments about the limitations of their computer technology:

"Our computers are mostly donated. What few we purchased were bought in 1984--the kids laugh at them, they have better at home."

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[8]We asked respondents to rate the overall condition of their school buildings on a 6-point scale: excellent, good, adequate, fair, poor, or replace. See School Facilities: Condition of America's Schools (GAO/HEHS-95-61, Feb. 1, 1995).

"Facility adaptation for computer networks, video networks, and phone access is expensive and makes justifying purchase of computer hardware more difficult."

Table 1: Millions of Students Attend Schools Reporting Insufficient Capability to Support Technology

Technology element	Percent of schools	Number of schools	Number of students affected (in millions)
Fiber optics cable	86.8	66,000	35.4
Phone lines for instructional use	61.2	47,000	24.8
Conduits/raceways for computer/computer network cables	60.6	46,600	24.9
Modems	57.5	44,200	23.0
Phone lines for modems	55.5	42,700	22.5
Computer networks for instructional use	51.8	40,100	20.7
Electrical wiring for computers/communications technology	46.1	35,700	19.3
Electrical power for computers/communications technology	34.6	26,800	14.5
Laser disk player/VCR	33.5	25,700	13.5
Cable TV	31.7	24,200	12.2
Computer printers for instructional use	29.3	22,700	11.9
Computers for instructional use	25.2	19,500	10.3
TVs	15.9	12,200	6.8
Schools reporting six or more insufficient technology elements	51.9	40,400	21.3

Our survey results were reflected in our site visits. Following are some observations made during our visits:

-- In Ramona, California, the two schools that were built in the past 5 years are wired for the latest technology. We learned, however, that some older schools needed to retrofit wiring to increase power for more demanding technologies; one elementary school had only two outlets in each classroom. If four teachers used their outlets at the same time, the circuit breakers tripped. This happened about once a month.

-- A similar situation exists in Montgomery County, Alabama. New schools are designed to meet technology needs. However, one school official in said that new electrical systems were the most common renovation needed at most schools to accommodate computers and other technologies.

-- In Chicago, new schools, like the Andrew Jackson Language Academy built in 1989, have and use computers because it has the infrastructure necessary for technology. In contrast, at another school we visited in Chicago, computers were still in boxes because they did not have sufficient power and outlets to use them.

Many education reformers say that it is unfair to hold students to nationwide standards if they have not had an equal--or roughly equal--opportunity to learn. If schools cannot provide students with sufficient technological backup or with sufficient facilities for instruction and services, they may not be providing even a roughly equal opportunity for all students to learn. This is particularly true in central cities and in schools that serve high percentages of minority and poor students.

CONCLUSION

Most of America's schools do not yet have key technologies or the facilities required to support learning into the 21st century. In particular, older, unrenovated schools need infrastructure renovation to support technology. What remains unclear, however, is how to fund the infrastructure renovation. I would be happy to answer any questions you may have.

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COMMUNICATIONS TECHNOLOGY IN SCHOOLS

Although technology is changing constantly and quickly becoming defined by complex interactive and multimedia[9] technologies and standards are only beginning to emerge,[10] it is helpful to regard school communications technology as comprising four basic electronic systems: technology infrastructure, data, voice, and video.

TECHNOLOGY INFRASTRUCTURE

Of the four systems, technology infrastructure may be the most important and least understood. Data, voice, and video systems cannot operate without either the building infrastructure or the system infrastructure necessary to support them. Building infrastructure consists of what needs to be built into the facility to make technology operate effectively throughout the school--the conduits/raceways through which computer and computer network cables are laid in the school, the cables and electrical wiring for computers and other communications technology, and the electrical power and related building features such as electric outlets. It is relatively easy and inexpensive to design a new building with this infrastructure included; installing this infrastructure in existing buildings can be expensive and disruptive to the educational process.

The other type of infrastructure--system infrastructure--links up various components of the technology. For example, computer network infrastructure consists of the software that actually runs the networking function--linking all the computers in a class or in the school or the computers in the school with computers in the outside world--as well as pieces of hardware like servers--the special computers with large information storage capabilities that allow many users to share information--whose purpose is to make the network work. Besides the network infrastructure, modems--small electrical devices that allow computers to communicate with each other through the phone lines--are another basic component of systems infrastructure that links data, voice, video, and even multimedia systems.

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[9]Multimedia uses a single communication system (cable) to transmit voice, data, and video, currently by digitizing voice and video.

[10]See, for example, The National Information Infrastructure: Requirements for Education and Training, National Coordinating Committee on Technology in Education and Training, (Alexandria, Va.: 1994).

This technology infrastructure, although initially more costly than the basic computer/printer, may have much more value. Educationally, it can link even the most remote or poor school with vast resources, including the finest libraries and the best teachers for a wide range of courses or course enhancements, like "virtual" field trips. Financially, according to the North Central Regional Educational Laboratory, the Internet and the emerging video and imaging technologies could be used to change the economic basis of schooling by drawing upon the free or low-cost resources and services to replace textbooks and other costly instructional materials, software, and other programs. Those funds could then be used for additional staffing, local curriculum development, technology staff, and ongoing local staff development, and the like.[11]

DATA SYSTEMS

Basic data systems include computers, some with CD-ROM capability, connected to printers. A baseline data system enables instructional computers to communicate with similar devices within the classroom or the school (local area networks). Optimally, a data system also includes computer networks compatible with outside resources (wide area networks) such as the Internet;[12] computers in the central office, in other schools, home computers; and databases from the Department of Education or Library of Congress.

VOICE SYSTEMS

Voice systems include accessible two-way voice communication and messaging (telephones) systems for staff members to communicate with each other in the building and with the school community. A baseline system includes a public address system, some outgoing

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[11]Beau Fly Jones et al. Learning, Technology and Policy for Educational Reform, July 1994, Version 1.0., North Central Regional Educational Laboratory (Oak Brook, Ill.: 1994).

[12]The Internet, a global communications network, is a cooperative effort among educational institutions, government agencies, and various commercial and nonprofit organizations. Historically, the Internet has contained mostly scientific research and education information. However, more recently, the kind of information accessible on the Internet has expanded to include library catalogs, full texts of electronic books and journals, government information, campuswide information systems, picture archives, and business data and resources. The Internet allows three primary functions: electronic mail and discussion groups (e mail), use of remote computers (telnet), and transferring files (file transfer protocol).

lines and telephones serving school offices and staff members, and incoming lines to meet community and administrative needs. Optimally, it also includes more outgoing and incoming lines and sufficient capacity to allow for such developing technologies as voice processing and voice mail.

VIDEO SYSTEMS

Video systems provide accessibility to television communication and all forms of video transmission from locations within the school building as well as from the outside. A baseline system includes capability to receive instructional and teacher professional programming as well as commercial and public television stations, whether through a master antenna or via cable, microwave, or satellite. An optimal system with today's technology also includes capability in classrooms and teachers' offices to dial up video sources in the school media center and to conduct two-way video-interactive classes between classrooms, inside the school, and between schools.

Relevant Survey Items With Overall Percent Response

17. Do this school's *on-site* buildings have sufficient capability in each of the communications technology elements listed below to meet the functional requirements of modern educational technology? *Circle one for EACH element listed.*

	Percent of Schools			
Technology Elements	Very Sufficient	Moderately Sufficient	Somewhat Sufficient	Not Sufficient
Computers for instructional use (N=77,400)	11.1	30.6	33.1	25.2
Computer printers for instructional use (N=77,412)	9.7	27.9	33.1	29.3
Computer networks for instructional use (N=77,350)	8.8	18.3	21.2	51.8
Modems (N=76,951)	4.9	14.0	23.6	57.5
Telephone lines for modems (N=76,986)	6.9	13.7	23.9	55.5
Telephones in instructional areas (N=76,827)	7.5	12.6	18.8	61.2
Television sets (N=77,211)	19.8	33.7	30.7	15.9
Laser disk players/VCRs (N=76,819)	7.7	25.4	33.5	33.5
Cable television (N=76,459)	20.1	25.9	22.3	31.7
Conduits/raceways for computer/computer network cables (N=76,987)	7.4	11.9	20.1	60.6
Fiber optic cable (N=76,015)	3.5	4.3	5.5	86.8
Electrical wiring for computers/communications technology (N=77,437)	7.8	17.7	28.4	46.1
Electrical power for computers/communications technology (N=77,414)	12.4	24.3	28.7	34.6

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18. How many computers for instructional use does this school have? *Include computers at both on-site buildings and off-site instructional facilities.*

_____ computers for instructional use (Range 0-1800
(Mean 50.7
(Median 37.0

19. How well do this school's *on-site* buildings meet the functional requirements of the activities listed below? *Circle one for EACH activity listed.*

	Percent of Schools			
Activity	Very Well	Moderately Well	Somewhat Well	Not Well At All
Small group instruction (N=77,606)	32.4	37.5	20.7	9.5
Large group (50 or more students) instruction (N=77,178)	10.7	24.4	26.7	38.2
Storage of alternative student assessment materials (N=77,058)	7.8	24.2	36.7	31.3
Display of alternative student assessment materials (N=76,797)	7.9	26.6	37.9	27.6
Parent support activities, such as tutoring, planning, making materials, etc. (N=77,496)	12.3	29.7	34.5	23.5
Social/Health Care Services (N=77,456)	10.8	30.1	32.1	27.0
Teachers' planning (N=77,397)	20.6	37.4	28.9	13.1
Private areas for student counseling and testing (N=77,530)	14.6	28.4	31.3	25.7
Laboratory science (N=76,344)	11.2	21.4	25.4	42.0
Library/Media Center (N=77,701)	24.9	35.3	26.5	13.4
Day care (N=72,083)	4.3	7.9	10.3	77.5
Before/after school care (N=73,335)	6.8	15.3	19.2	58.8

Data—Technology Elements

Table III.1: Majority of States Report That at Least 50 Percent of Schools Have Six or More Insufficient Technology Elements

Percent of schools with six or more insufficient technology factors	States
20-29	Nevada, South Dakota
30-39	Arkansas, Iowa, Kentucky, Minnesota, North Dakota, Pennsylvania, Texas, Wyoming
40-49	Arizona, Colorado, Georgia, Indiana, Kansas, Mississippi, Montana, Nebraska, New Jersey, West Virginia, Wisconsin
50-59	Alaska, Connecticut, District of Columbia, Florida, Louisiana, Maryland, Missouri, New York, Oklahoma, South Carolina, Tennessee, Utah, Vermont, Virginia
60-69	Alabama, California, Idaho, Illinois, Massachusetts, Maine, Michigan, North Carolina, New Hampshire, Oregon, Rhode Island, Washington
70-79	Delaware, Hawaii, New Mexico, Ohio

Note: Sampling errors range ± 7.1-13.5 percent.

Table III.2: Percent of Schools Reporting Insufficient Technology Elements—Data, Voice, Systems Infrastructure—by State

State	Computers	Printers	Networks	Modems	Phone lines for modems	Phone lines instructional area
Alabama	32.1	36.3	58.6	61.7	55.4	64.1
Alaska	35.5	36.2	56.4	56.9	53.8	60.9
Arizona	15.8	18.3	46.4	60.8	58.1	61.8
Arkansas	9.5	17.5	36.7	63.7	56.4	59.3
California	37.1	39.7	69.8	70.5	68.1	64.8
Colorado	20.9[a]	23.9[a]	37.0[a]	61.6	56.8	45.3
Connecticut	26.5[a]	29.9[a]	63.6[a]	55.4[a]	51.9[a]	52.7[a]
Delaware	44.5[b]	52.7[b]	65.7[b]	83.0[a]	82.9[a]	82.4[a]
District of Columbia	22.0[a]	31.4[a]	37.1[a]	49.5[b]	52.7[b]	52.6[b]
Florida	28.6	28.9	66.4	65.0	63.2	62.3
Georgia	11.6	13.7	33.9	48.0	53.0	71.7
Hawaii	39.0	44.7[a]	72.0	75.7	79.5	74.7
Idaho	25.3	31.6	55.9	63.9	58.8	72.1
Illinois	30.2	39.0	57.7	65.7	63.4	64.2
Indiana	16.5	18.3	42.1	50.7	55.0	58.2
Iowa	15.3	16.5	43.5	48.5	43.8	55.4
Kansas	22.9	27.7	44.0	47.3	44.4	61.7
Kentucky	13.1	19.8	35.5	57.2	55.7	67.2

(continued)

State	Computers	Printers	Networks	Modems	Phone lines for modems	Phone lines instructional area
Louisiana	31.6	38.6	62.5	59.5	65.5	78.7
Maine	31.0[a]	31.8[a]	62.9[a]	69.6[a]	63.8[a]	69.4[a]
Maryland	29.1	30.4	44.1	62.3	66.7	87.0
Massachusetts	32.5[a]	43.1[a]	70.4	71.1	66.9	71.9
Michigan	36.9	38.8	63.3	64.1	58.1	63.4
Minnesota	22.5	21.7	41.5	42.7	41.0	41.4
Mississippi	16.9	20.3	37.6	53.8	55.8	62.7
Missouri	23.3	32.8	52.4	60.5	59.1	65.4
Montana	17.1	19.0	47.5	46.8	37.5	53.2
Nebraska	11.2	10.1	43.3[a]	55.5[a]	45.7[a]	44.4[a]
Nevada	14.4	15.9	26.9	28.2	26.2	27.1
New Hampshire	44.0[a]	42.9[a]	65.6[a]	68.4	58.6[a]	66.4[a]
New Jersey	20.0	24.5	41.8[a]	38.1[a]	33.5	62.9
New Mexico	36.3	44.9	69.6	79.0	58.5	57.3
New York	20.2	24.2	44.0	48.9	55.3	57.9
North Carolina	30.1	33.3	51.1	62.2	62.6	73.8
North Dakota	17.3	19.8	36.7	40.2	36.5	46.9
Ohio	38.2	50.7	71.8	74.0	70.5	76.2
Oklahoma	22.9	33.0	50.8	63.4	57.7	60.0
Oregon	38.2	41.8	66.2	59.8	65.1	65.6
Pennsylvania	18.2	19.4	50.2[a]	54.7[a]	44.2[a]	48.7[a]
Rhode Island	37.1[a]	42.7[a]	49.3[a]	67.3[a]	52.1[a]	67.3
South Carolina	33.0	35.1	56.1	55.2	50.3	61.5
South Dakota	9.8	9.9	37.0	37.0	35.4	42.0
Tennessee	20.4	22.8	48.0	62.7	65.6	68.6
Texas	12.8	15.6	31.3	38.9	38.4	44.0
Utah	6.9	7.9	28.7	54.4	71.0	77.5
Vermont	32.7[b]	31.7[b]	65.7[a]	55.9[b]	61.4[b]	56.1[b]
Virginia	31.3	37.7	56.5	54.1	52.9	56.0
Washington	32.0	39.8	60.5	61.8	61.1	66.3
West Virginia	16.5	17.2	32.3	56.8	51.5	71.8
Wisconsin	22.4	24.5	44.6	45.4	46.4	58.9
Wyoming	9.8	13.2	32.7	41.4[a]	33.8	44.5

Note: Sampling errors are less than ± 11 percent unless otherwise noted. Responses marked with a superscript "a" have sampling errors equal to or greater than 11 percent but less than 13 percent. Responses marked with a superscript "b" have sampling errors equal to or greater than 13 percent but less than 16 percent. Sampling errors may be high for state tables because they are not adjusted for finite population correction.

Table III. 3: Percent of Schools Reporting Insufficient Technology Elements—Video and Building Infrastructure—by State

State	Television	Laser disk player/VCR	Cable TV	Conduits	Cable	Wiring	Power
Alabama	15.0	34.6	33.3	61.9	74.8	44.1	33.9
Alaska	35.3	46.3	55.6	67.4	90.9	52.1	44.7
Arizona	16.8	23.1	30.4	56.0	83.5	36.3	27.6
Arkansas	6.6	21.6	12.6	43.1	85.1	34.1	19.8
California	21.0	41.2	49.9	79.7	92.8	69.1	55.6
Colorado	16.9	29.7[a]	28.8	49.7[a]	88.2	38.5[a]	32.7[a]
Connecticut	25.1	35.0[a]	42.4[a]	62.9[a]	91.3	55.1[a]	41.2[a]
Delaware	32.8[b]	60.9[b]	45.4[b]	76.9[a]	93.3	69.5[b]	48.8[b]
District of Columbia	21.6[a]	31.4[a]	25.6[a]	50.0[b]	58.0[b]	45.8[b]	41.4[b]
Florida	8.6	28.9	19.7	67.6	88.0	64.3	41.9
Georgia	14.8	28.8	12.9	57.8	87.1	44.0	38.3
Hawaii	4.7	29.8	18.8	82.1	89.7	75.1	61.4
Idaho	23.0	44.5	42.7	72.3	91.0	51.2	36.8
Illinois	23.3	43.7	43.4	68.8	87.0	52.6	41.1
Indiana	12.9	24.0	27.1	52.3	82.9	43.1	32.0
Iowa	4.5	21.0	13.2	49.9	84.9	31.3	15.4
Kansas	17.9	34.9	31.2	57.3	89.0	40.7	33.6
Kentucky	3.2	23.2	8.0	49.8	75.2	35.8	25.1
Louisiana	18.4	40.4	42.7	61.6	87.7	47.2	38.6
Maine	19.7	43.7[a]	46.2[a]	72.6	94.0	46.7[a]	35.0[a]
Maryland	36.2	52.1	38.5	61.9	91.8	46.8	36.0
Massachusetts	34.9[a]	48.0[a]	44.2[a]	73.9	88.1	60.8	49.4[a]
Michigan	27.1	42.1	27.1	68.7	85.6	51.0	38.3
Minnesota	17.3	31.6	27.4	48.9	72.3	7.4	25.2
Mississippi	4.9	36.7	32.5	55.6	85.0	26.6	19.9
Missouri	6.6	26.0	17.3	53.2	87.9	33.7	26.0
Montana	14.6	25.4	42.0	62.1	81.7	38.8	24.9
Nebraska	1.7	12.5	31.0[a]	62.4	83.3	33.1	21.2
Nevada	4.1	13.9	14.8	43.6	78.2	28.4	25.1
New Hampshire	27.4[a]	43.7[a]	26.8[a]	69.4	88.8	57.7[a]	35.8[a]
New Jersey	11.2	24.9	32.5	55.2[a]	85.8	41.2[a]	34.2
New Mexico	15.4	54.8	51.6	77.3	87.1	48.5	42.1
New York	24.7	38.1	35.9	55.5	82.3	50.7	34.7
North Carolina	15.2	30.9	24.5	66.0	92.3	55.4	41.8
North Dakota	15.1	30.9	27.5	56.0	69.5	33.8	17.7
Ohio	16.0	44.1	31.3	76.6	95.0	63.0	50.6

(continued)

State	Television	Laser disk player/VCR	Cable TV	Conduits	Cable	Wiring	Power
Oklahoma	18.8	35.2	32.8	54.6	81.7	41.4	32.3
Oregon	29.9	35.6	23.3	68.0	87.6	56.0	33.7
Pennsylvania	13.9	34.7[a]	27.4	41.0[a]	86.6	32.2	17.4
Rhode Island	24.4	41.0[a]	17.3	74.0	90.8	64.2[a]	45.0[a]
South Carolina	5.6	25.3	29.8	62.9	87.1	41.1	33.2
South Dakota	7.8	22.4	13.6	43.3	69.7	22.9	14.6
Tennessee	6.9	37.1	27.1	58.0	94.3	38.8	25.4
Texas	8.7	17.0	31.6	46.0	83.0	28.6	22.3
Utah	4.8	22.1	39.4	55.3	93.3	38.8	26.7
Vermont	10.0	38.1[b]	57.8[b]	69.3[a]	95.6	48.5[b]	26.2[b]
Virginia	4.1	36.7	18.4	57.5	93.5	36.1	29.5
Washington	15.0	41.2	34.9	61.0	86.3	47.0	35.1
West Virginia	4.2	30.8	14.4	49.9	93.2	36.2	18.0
Wisconsin	11.3	24.2	20.5	52.5	86.3	36.5	33.4
Wyoming	11.6	21.2	40.1[b]	50.9[b]	83.6	29.6	15.9

Note: Sampling errors are less than ± 11 percent unless otherwise noted. Responses marked with a superscript "a" have sampling errors equal to or greater than 11 percent but less than 13 percent. Responses marked with a superscript "b" have sampling errors equal to or greater than 13 percent but less than 16 percent. Sampling errors may be high for state tables because they are not adjusted for finite population correction.

Table III.4: Percent of Schools Reporting Insufficient Technology Elements by Community Type

Technology element	Central city	Urban fringe/ large town	Rural/ small town
Fiber optic cable	90.2	87.8	84.4
Conduits	66.9	61.9	55.6
Phone lines in instructional areas	66.8	60.6	57.8
Modems	65.0	55.9	53.5
Networks	60.9	50.6	46.5
Phone lines for modems	61.3	55.3	51.8
Electrical wiring for communications technology	54.8	46.7	40.1
Electric power for communications technology	42.9	36.9	27.8
Laser disk player/VCRs	38.7	32.2	30.9
Printers	38.1	26.7	25.2
Cable TV	33.0	32.8	30.0
Computers	31.7	24.5	21.2
TVs	18.6	17.1	13.3
Six or more unsatisfactory technology elements	60.0	52.0	46.5

Note: Sampling errors range ± 1.7-3.5 percent.

Table III.5: Percent of Schools Reporting Insufficient Technology Elements by Level of School

Technology element	Elementary	Secondary	Combined
Fiber optic cable	88.3	82.9	84.7
Conduits	63.3	53.1	60.6
Phone lines in instructional areas	64.4	53.2	52.8
Modems	60.9	48.4	54.1
Networks	54.8	42.9	53.6
Phone lines for modems	58.4	47.8	52.3
Electrical wiring for communications technology	48.7	39.2	42.9
Electric power for communications technology	36.7	29.1	30.5
Laser disk player/VCRs	34.9	30.1	29.7
Printers	31.7	23.2	25.9
Cable TV	33.7	24.3	42.7
Computers	27.0	20.3	22.2
TVs	17.3	11.9	14.8
Six or more unsatisfactory technology elements	55.7	41.5	50.9

Note: Sampling errors range ± 1.4-4.0 percent.

Table III.6: Percent of Schools Reporting Insufficient Technology Elements by Proportion of Minority Students

	Percent of minority students in schools			
Technology element	**Less than 5.5**	**5.5 to 20.4**	**20.5 to 50.4**	**More than 50.5**
Fiber optic cable	85.6	86.2	88.2	88.3
Conduits	59.3	56.2	65.5	62.9
Phone lines in instructional areas	60.7	59.4	60.6	64.9
Modems	55.9	52.7	59.9	63.1
Networks	48.9	49.6	56.2	55.0
Phone lines for modems	54.0	51.2	58.7	59.9
Electrical wiring for communications technology	42.3	44.7	46.9	53.5
Electric power for communications technology	30.3	30.5	36.3	44.8
Laser disk player/VCRs	31.3	29.1	37.6	38.4
Printers	27.1	28.5	30.3	33.4
Cable TV	28.2	25.7	33.9	41.4
Computers	23.5	24.9	25.6	28.0
TVs	13.1	15.4	14.7	22.3
Six or more unsatisfactory technology elements	48.7	50.0	54.4	57.4

Note: Sampling errors range ± 1.8-4.0 percent.

Table III.7: Percent of Schools Reporting Insufficient Technology Elements by Geographic Region

Technology element	Northeast	Midwest	South	West
Fiber optic cable	86.5	85.7	86.1	89.4
Conduits	57.2	61.5	56.0	69.0
Phone lines in instructional areas	59.2	60.9	62.0	61.9
Modems	53.9	57.8	54.9	63.9
Networks	52.0	53.3	45.6	59.0
Phone lines for modems	51.0	55.1	54.2	61.6
Electrical wiring for communications technology	47.2	44.9	40.9	55.0
Electric power for communications technology	33.5	34.0	30.4	42.6
Laser disk player/VCRs	36.7	33.5	29.7	36.7
Printers	27.6	31.4	25.6	33.6
Cable TV	35.4	28.3	26.4	41.3
Computers	23.7	26.2	21.7	30.1
TVs	21.0	15.7	11.3	18.9
Six or more unsatisfactory technology elements	50.8	52.3	47.1	59.9

Note: Sampling errors range ± 1.6-4.6 percent.

Table III.8: Percent of Schools Reporting Insufficient Technology Elements by Proportion of Students Approved for Free or Reduced Lunch

Technology element	Percent of students approved for free or reduced lunch			
	Less than 20	20 to less than 40	40 to less than 70	70 or more
Fiber optic cable	86.9	86.3	87.9	88.9
Conduits	59.2	60.4	64.1	62.2
Phone lines in instructional areas	57.9	59.9	64.3	68.2
Modems	52.1	56.1	62.4	61.9
Networks	48.0	50.1	56.3	54.3
Phone lines for modems	51.7	56.2	57.4	59.5
Electrical wiring for communications technology	45.7	43.5	48.7	47.4
Electric power for communications technology	32.2	32.0	35.5	38.1
Laser disk player/VCRs	30.3	30.6	37.8	34.1
Printers	23.7	28.4	33.3	30.0
Cable TV	25.5	28.6	31.8	37.8
Computers	20.9	23.7	28.0	25.4
TVs	14.5	12.4	16.2	17.3
Six or more unsatisfactory technology elements	47.7	49.6	56.0	56.1

Note: Sampling errors range ± 1.7-3.9 percent.

Table III. 9: Average Number of Students per Computer by State

State	Students per computer
Alabama	16.8
Alaska	7.6
Arizona	11.9
Arkansas	12.5
California	21.1
Colorado	12.6
Connecticut	14.5
Delaware	17.7
District of Columbia	17.2
Florida	12.1
Georgia	13.4
Hawaii	15.6
Idaho	12.7
Illinois	18.9
Indiana	11.1

(continued)

State	Students per computer
Iowa	10.9
Kansas	9.9
Kentucky	10.2
Louisiana	20.6
Maine	16.9
Maryland	14.9
Massachusetts	15.6
Michigan	19.9
Minnesota	10.2
Mississippi	14.5
Missouri	15.2
Montana	7.9
Nebraska	10.3
Nevada	21.4
New Hampshire	20.8
New Jersey	13.5
New Mexico	10.8
New York	15.6
North Carolina	13.4
North Dakota	8.7
Ohio	25.3
Oklahoma	13.2
Oregon	15.5
Pennsylvania	14.8
Rhode Island	21.6
South Carolina	12.4
South Dakota	9.0
Tennessee	18.7
Texas	11.4
Utah	11.7
Vermont	16.9
Virginia	12.7
Washington	13.7
West Virginia	12.9
Wisconsin	10.7
Wyoming	7.0

Note: Sample errors range ± 1.1-4.9 percent, except Vermont, which was 8 percent.

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